Application No. 10/645,333
Filed: August 21, 2003
TC Art Unit: 1742
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REMARKS

Claim 1 has been amended for clarity and to correct a typographical error in the word "kneading". The amendment is supported in the specification at Page 2, lines 27-29, "the carbon nano material and the metal material are formed to the granules", so that "kneading the granules" (page 2, line 16) would necessarily and reasonably include the currently amended claim language, "... melting the metal in the granules and kneading the metal and carbon nano materials ... (etc.)".

1. Claim Rejections Under 35 USC 103(a)

The Examiner has rejected claims 1-3 under 35 USC 103(a) as being unpatentable over Kato et al. in view of Prater et al. and Tennent et al.

Applicant's method disclosed in claim 1 comprises the following steps:

(a) mixing a carbon nano material with a metal material in a powder state;

(b) compressing a resultant mixed material to a solid material by a hot press; and

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(c) forming said solid mixed material to granules such as chips, pellets, and the like.

Then the composite metal product is obtained from said granules by the following steps:

(d) melting the metal in the granules and kneading the metal and carbon nano material to form a composite material;

(e) injecting the composite material into a mold to form the composite metal product; and

(f) obtaining the composite metal product.

The effect of the present invention is recited precisely on page 2, line 25 to page 3, line 7 of the present specification.

Kato et al. discloses a process comprising the steps of melting a metal material, injecting said melted material into a mold to form a product and obtaining the product. Kato et al. discloses that metallic feed is composed of particles in the form of grains or columns or in the forms of shavings. However, Kato et al. does not disclose a method that includes the above steps (a), (b) and (c) for producing a solid granulated material containing a carbon nano material and a metal material. Further, Kato et al. does not disclose a composite metal product containing the carbon nano material and the metal material from said solid granulated material. As Examiner admits, "Kato et al. does not

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disclose wherein the metal includes nano-dispersion strengthened metal materials." Neither, in fact, does Kato et al. make any mention of metal composites including carbon.

The Examiner states that Prater et al. teaches to add carbon to metal matrix material to form carbon-reinforced metal matrix composite (col. 5, line 23). Examiner then asserts that Prater et al. teaches that the carbon nano material is added to the metals (referencing col. 6, lines 1-16). Applicant respectfully disagrees. First, Prater et al. only discloses "carbon fiber" as a reinforcement material (e.g., column 5, lines 36-37; column 7, line 51). Examiner admits that Prater et al. is silent as to the particle size of the carbon fiber. As discussed in more detail below, "carbon nano material" is not the same as "carbon fiber". Therefore, the Prater et al. disclosure of mixing powder, hot-pressing and extruding into "billets" to be then cut as "slugs" (column 6, lines 2-3) could extend only as far as mixing ***carbon-fiber*** powder, but would not teach making such a mixture of ***carbon nano material*** and metal material. Therefore, Prater et al. does not disclose a step of forming a compressed solid mixed material containing carbon nano material to form granules such as chips, pellets, and the like. Thus, by reason of not teaching use of carbon nano material, Prater et al. does not teach the steps of

(a), (b) and (c) of the present invention. For the same reason, Prater et al. does not teach the steps of (d), (e) and (f) above. Further, with reference to step (d), Prater et al. does not teach kneading of the feedstock after partial melting of the slugs; rather, the partially remelted slugs are injected with no mention of further mixing, grinding, or the like (Fig. 8; column 6, lines 37-58).

The Examiner states that Tennent et al. teaches that carbon fibers in the nano particle size scale are used for metal matrix reinforcement material, such that it would be obvious to modify the invention of Kato et al. by the teachings of Prater et al. and Tennent et al. in order to form a reinforced metal matrix with "carbon nano fibers". Applicant respectfully argues that here the Examiner has made a crucial error in understanding and applying the disclosure and teaching of Tennent et al.

Tennent et al. discloses fabrication of nano-scale carbon "fibrils" and further explicitly distinguishes "carbon fibrils" from "carbon fibers". At column 1, lines 53-56, Tennent et al. states, "There is a practical lower limit of fiber diameter, i.e., 6 to 8 micrometers, below which fiber breakage in spinning and posttreatments becomes excessive." The "carbon fibril" disclosed by Tennent et al. is "characterized by a substantially constant

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diameter between about 3.5 and about 70 nanometers, [...] length [...] less than about 100 times the diameter, [...]". Thus, Tennent et al. discloses carbon fibrils that are distinctly and substantially smaller in diameter than "carbon fibers." For further evidence that Tennent et al. teaches nano-scale "carbon fibrils" to be different from "carbon fibers" Examiner is referred to column 18, lines 58-60: "[...] comprising a carbon fiber and a plurality of carbon fibrils, wherein said fibrils adhere to the outer surface of the fiber." Therefore, it is inappropriate to combine Tennant et al. with Prater et al., because Prater et al. speaks only of "carbon fiber", and Tennent et al. clearly distinguishes carbon nano material from "carbon fiber." There is no reference in either disclosure that supports use by the Examiner of Examiner's constructed term: "carbon nano fibers".

Tennent et al. further teaches away from Applicant's invention by disclosing that "the carbon fibrils of this invention may be dispersed into the matrix, oriented in the matrix by means of e.g., electrical fields, appropriate shearing action or combing, embedded in the matrix by e.g., impregnation, or injected into the matrix, e.g., by means of spray guns." (column 6, lines 3-7). Nothing in this teaching suggests combining carbon nano material and metal material to form a compressed, resultant mixed

material to be used as a feedstock in the context of composite product fabrication methods as disclosed by Prater et al. or by Kato et al.

In summary, by virtue of the above arguments, Tennent et al. does not teach the steps of (a), (b) and (c) of the present invention. Further, Tennent et al. clearly does not teach the steps of (d), (e) or (f). Because Tennent et al. disclose forming metal composites containing carbon nano-scale fibrils, which are different from "carbon fibers", it is therefore not appropriate to combine teaching of Tennent et al. with Prater et al.

Applicant's invention, at each and every step, pertains to and involves carbon nano material. Prater et al. do not disclose any methods that pertain to carbon nano materials, therefore Prater et al. do not teach any of the steps of Applicant's invention. Kato et al. do not disclose any methods that pertain to carbon at all, therefore Kato et al. do not teach any of the steps of Applicant's invention.

Therefore, allowance is hereby requested.

2. Double Patenting

Please find attached a Terminal Disclaimer to overcome the judicially created doctrine of obvioiusness-type double patenting.

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The Examiner is encouraged to telephone the undersigned attorney to discuss any matter that would expedite allowance of the present application.

Respectfully submitted,

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